
**Plastics piping systems for soil and waste
discharge (low and high temperature)
inside buildings — Unplasticized poly(vinyl
chloride) (PVC-U)**

*Systèmes de canalisations en plastique pour l'évacuation des eaux-vannes
et des eaux usées (à basse et à haute température) à l'intérieur des
bâtiments — Poly(chlorure de vinyle) non plastifié (PVC-U)*



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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 3633 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 1, *Plastics pipes and fittings for soil, waste and drainage (including land drainage)*.

This second edition cancels and replaces the first edition (ISO 3633:1991), which has been technically revised.

Introduction

Pipes and fittings conforming to this International Standard also meet the requirements of EN 1329-1 which are applicable to those pipes and fittings which, according to EN 1329-1, are intended to be used inside buildings (application area code “B”, see EN 1329-1) only.

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Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings — Unplasticized poly(vinyl chloride) (PVC-U)

1 Scope

This International Standard specifies the requirements for unplasticized poly(vinyl chloride) (PVC-U) pipes and fittings for soil and waste discharge (low and high temperature) inside buildings, as well as the system itself. It does not include buried pipework.

It also specifies the test parameters for the test methods referred to in this International Standard.

This International Standard is applicable to PVC-U pipes and fittings, as well as assemblies of such pipes and fittings, intended to be used for the following purposes:

- a) soil and waste discharge pipework for the conveyance of domestic waste waters (low and high temperature);
- b) ventilation pipework associated with a);
- c) rainwater pipework inside the building.

This International Standard does not cover requirements for the *K*-value of the raw material.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 265-1, *Pipes and fittings of plastics materials — Fittings for domestic and industrial waste pipes — Basic dimensions: Metric series — Part 1: Unplasticized poly(vinyl chloride) (PVC-U)*

ISO 3126:—¹⁾, *Plastics piping systems — Plastics piping components — Measurement and determination of dimensions*

EN 580, *Plastics piping systems — Unplasticized poly(vinyl chloride) (PVC-U) pipes — Test method for the resistance to dichloromethane at a specified temperature (DCMT)*

EN 681-1, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

1) To be published. (Revision of ISO 3126:1974)

EN 681-2, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers*

EN 727, *Plastics piping and ducting systems — Thermoplastics pipes and fittings — Determination of Vicat softening temperature (VST)*

EN 743, *Plastics piping and ducting systems — Thermoplastics pipes — Determination of the longitudinal reversion*

EN 744, *Plastics piping and ducting systems — Thermoplastics pipes — Test method for resistance to external blows by the round-the-clock method*

EN 763, *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Test method for visually assessing effects of heating*

EN 1053, *Plastics piping systems — Thermoplastics piping systems for non-pressure applications — Test method for watertightness*

EN 1054, *Plastics piping systems — Thermoplastics piping systems for soil and waste discharge — Test method for airtightness of joints*

EN 1055:1996, *Plastics piping systems — Thermoplastics piping systems for soil and waste discharge inside buildings — Test method for resistance to elevated temperature cycling*

EN 1329-1, *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: Specifications for pipes, fittings and the system*

EN 1411, *Plastics piping and ducting systems — Thermoplastics pipes — Determination of resistance to external blows by the staircase method*

EN 1905, *Plastics piping systems — Unplasticized poly(vinyl chloride) (PVC-U) pipes, fittings and material — Method for assessment of the PVC content based on total chlorine content*

3 Symbols and abbreviations

3.1 Symbols

A	length of engagement
C	depth of sealing zone
d_e	outside diameter (at any point)
d_{em}	mean outside diameter
d_n	nominal outside diameter
d_s	inside diameter of the socket
d_{sm}	mean inside diameter of the socket
DN	nominal size
DN/OD	nominal size (outside-diameter related)
e	wall thickness (at any point)
e_m	mean wall thickness

e_2	wall thickness of the socket
e_3	wall thickness at the groove
H	length of chamfer
L_1	length of spigot
L_2	length of socket
l	effective length of a pipe
R	radius of swept fittings
z	design length (z -length) of a fitting
α	nominal angle of a fitting

3.2 Abbreviations

PVC-U	unplasticized poly(vinyl chloride)
TIR	true impact rate

4 Material

4.1 Raw material

The raw material shall be PVC-U to which are added those additives that are needed to facilitate the manufacture of components conforming to the requirements of this International Standard. For the use of non-virgin material, it is recommended that the specifications given in EN 1329-1 are followed.

NOTE Definitions concerning materials are given in EN 1329-1.

When calculated for a known formulation, and in cases of dispute and in cases when the formulation is not known, the PVC content, determined in accordance with EN 1905, shall be at least 80 % by mass for pipes and at least 85 % by mass for injection-moulded fittings.

4.2 Sealing ring retaining means

Sealing rings may be retained using means made from polymers other than PVC-U, provided the joints conform to the requirements given in clause 9.

4.3 Fire behaviour

No specific requirements are set by this International Standard for fire behaviour. Attention is drawn to the need to comply with any relevant national regulations in this respect.

5 General characteristics

5.1 Appearance

When viewed without magnification, the following requirements shall be met:

- the internal and external surfaces of pipes and fittings shall be smooth, clean and free from grooving, blistering, impurities, pores or any other surface irregularity likely to prevent conformity of pipes and fittings to this International Standard;
- each end of a pipe or fitting shall be cleanly cut, if applicable, and shall be square to its axis.

5.2 Colour

Pipes and fittings shall be coloured through the whole wall.

The recommended colour for pipes and fittings is grey.

6 Geometrical characteristics

6.1 General

All dimensions shall be measured in accordance with ISO 3126:—.

In cases of dispute, the reference temperature shall be $(23 \pm 2) ^\circ\text{C}$.

The figures are schematic sketches only, to indicate the relevant dimensions. They do not necessarily represent manufactured components. The dimensions given shall be conformed to however.

6.2 Dimensions of pipes

6.2.1 Outside diameter

The mean outside diameter, d_{em} , shall conform to Table 1 or Table 2, as applicable.

6.2.2 Out-of-roundness

The out-of-roundness, measured directly after production, shall be less than or equal to $0,024d_n$.

Table 1 — Mean outside diameters
(metric series)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Mean outside diameter	
		d_{em} min.	max.
32	32	32,0	32,2
40	40	40,0	40,2
50	50	50,0	50,2
63	63	63,0	63,2
75	75	75,0	75,3
80	80	80,0	80,3
82	82	82,0	82,3
90	90	90,0	90,3
100	100	100,0	100,3
110	110	110,0	110,3
125	125	125,0	125,3
140	140	140,0	140,4
160	160	160,0	160,4
180	180	180,0	180,4
200	200	200,0	200,5
250	250	250,0	250,5
315	315	315,0	315,6

Table 2 — Mean outside diameters
(series based on inch dimensions)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Mean outside diameter	
		d_{em} min.	max.
36	36	36,2	36,5
43	43	42,8	43,1
56	56	55,8	56,1

6.2.3 Effective lengths of pipes

The effective length (useful length) of a pipe, l , shall be not less than that specified by the manufacturer when measured as shown in Figure 1.

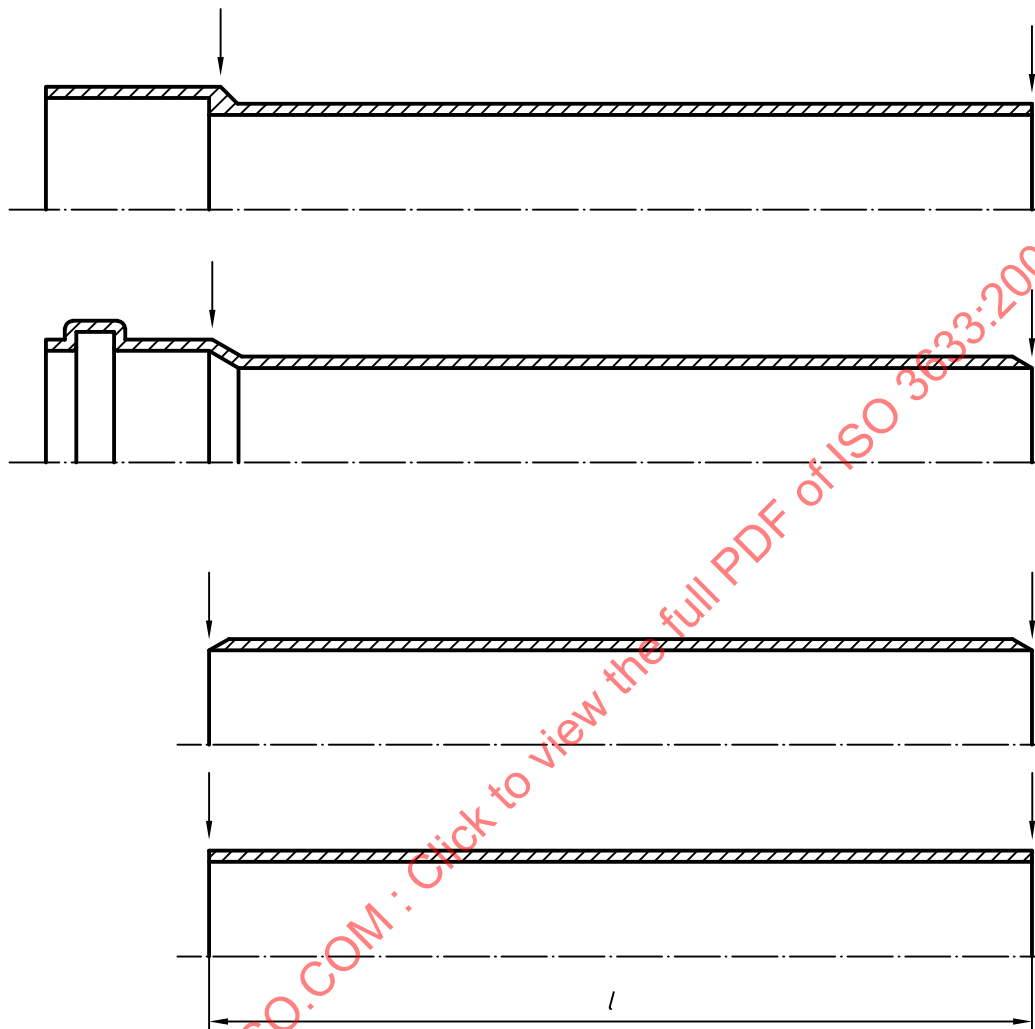


Figure 1 — Effective lengths of pipes

6.2.4 Chamfering

If a chamfer is applied, the angle of chamfering shall be between 15° and 45° to the axis of the pipe (see Figure 4 or 5). The remaining wall thickness at the end of the pipe shall be at least $1/3$ of $e_{\min}$.

6.2.5 Wall thickness

The wall thickness, e , shall conform to Table 3 or Table 4, as applicable, but for the metric series a maximum wall thickness at any point up to $1,2e_{\min}$ is permitted, provided that the mean wall thickness, e_m , is less than or equal to the specified $e_{m,\max}$.

Table 3 — Wall thicknesses
(metric series)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Wall thickness	
		e min.	e_m max.
32	32	3	3,5
40	40	3	3,5
50	50	3	3,5
63	63	3	3,5
75	75	3	3,5
80	80	3	3,5
82	82	3	3,5
90	90	3	3,5
100	100	3	3,5
110	110	3,2	3,8
125	125	3,2	3,8
140	140	3,2	3,8
160	160	3,2	3,8
180	180	3,6	4,2
200	200	3,9	4,5
250	250	4,9	5,6
315	315	6,2	7,1

Table 4 — Wall thicknesses
(series based on inch dimensions)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Wall thickness	
		e min.	e_m max.
36	36	3	3,5
43	43	3	3,5
56	56	3	3,5

6.2.6 Dimensions of sockets

The dimensions of solvent cement sockets (see Figure 4) and ring seal sockets (see Figure 5) of pipes shall be the same as for fittings (see 6.4).

6.3 Dimensions of fittings

6.3.1 Outside diameters

The mean outside diameter, d_{em} , of the spigot shall conform to Table 1 or Table 2, as applicable.

6.3.2 z-lengths

The design length(s) [z-length(s)] of fittings (see Figures 8 to 11 and 13 to 17) shall be given by the manufacturer.

NOTE The z-length(s) of a fitting are intended to assist in the design of moulds and are not intended to be used for quality control purposes. ISO 265-1 may be used as a guideline.

6.3.3 Wall thickness

6.3.3.1 General

Fittings and those parts of fittings not intended to come into contact with the fluid being conveyed are not required to conform to the wall thicknesses given in Tables 5 to 7, as applicable.

Where a fitting or adaptor provides a transition between two nominal sizes, the wall thickness of each connecting part shall conform to the requirements for the applicable nominal size. In such cases, the wall thickness of the fitting body is permitted to change gradually from the one wall thickness to the other.

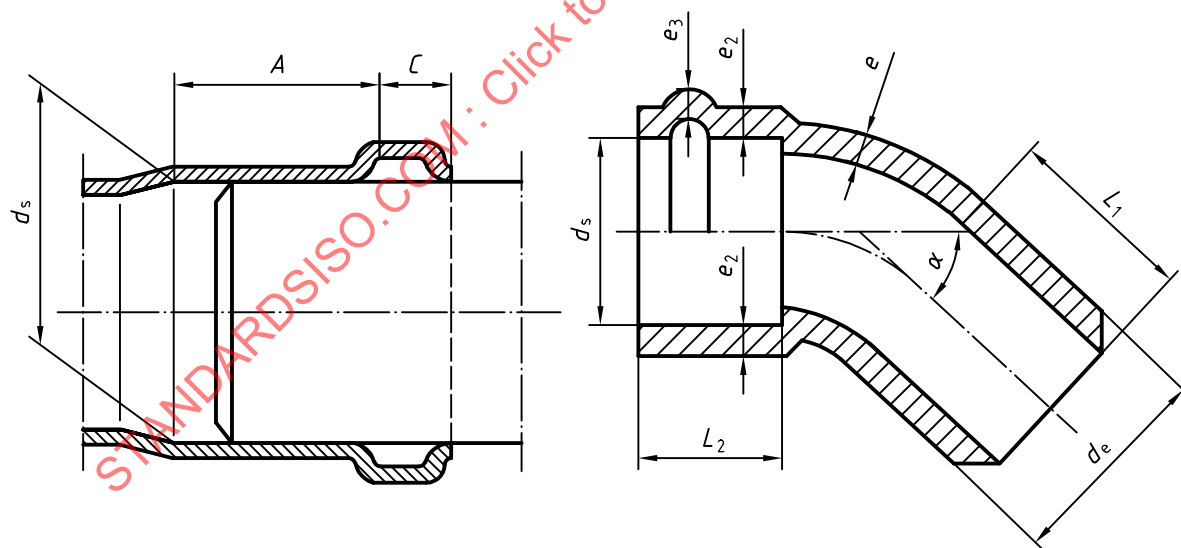


Figure 2 — Points of measurement for spigots and typical type of socket

6.3.3.2 Solvent cement fittings

For solvent cement fittings, the wall thicknesses, e and e_2 (see Figure 2), shall be equal to or greater than the values given in Table 5 or Table 6, as applicable.

For solvent cement fittings, a reduction of 5 % in wall thickness resulting from core shifting is permitted. In such a case, the average of two opposite wall thicknesses shall be equal to or greater than the values given in Table 5 or Table 6, as applicable.

Table 5 — Wall thicknesses of solvent cement fittings
(metric series)

Dimensions in millimetres			
Nominal size	Nominal outside diameter	Wall thickness	Wall thicknesses of sockets and spigots ^a
DN/OD	d_n	e min.	$(e_2 = 0,75e)$ e_2 min.
32	32	3	2 ^b
40	40	3	2 ^b
50	50	3	2 ^b
63	63	3	2 ^b
75	75	3	2 ^b
80	80	3	2,3
82	82	3	2,3
90	90	3	2,3
100	100	3	2,3
110	110	3,2	2,4
125	125	3,2	2,4
140	140	3,2	2,4
160	160	3,2	2,4
180	180	3,6	2,7
200	200	3,9	2,9
250	250	4,9	3,7
315	315	6,2	4,7
^a Where the wall thickness of spigots is below $e_{\min}$, these fittings may only be used in a solvent cement system and shall be marked in accordance with Table 24 as being for solvent cement joints only. ^b $e_2 = 0,65e$. Fittings with such a wall thickness may only be used in a solvent cement system and shall be marked in accordance with Table 24 as being for solvent cement joints only.			

Table 6 — Wall thicknesses of solvent cement fittings
(series based on inch dimensions)

Dimensions in millimetres			
Nominal size	Nominal outside diameter	Wall thickness	Wall thicknesses of sockets and spigots ^a
DN/OD	d_n	e min.	e_2 min. ($e_2 = 0,75e$)
36	36	3	2,3
43	43	3	2,3
56	56	3	2,3
For existing tools, the following values of the wall thickness are allowed, provided that the deviating value of the wall thickness, e , is marked on the fitting:			
DN/OD	d_n	e min.	e_2 min.
36	36	2,7	2
43	43	2,7	2
56	56	2,7	2
^a Where the wall thicknesses of spigots are below $e_{\min}$, these fittings may only be used in a solvent cement system and shall be marked in accordance with Table 24 as being for solvent cement joints only.			

6.3.3.3 Ring seal fittings

For ring seal fittings, the wall thicknesses e , e_2 and e_3 (see Figure 2), shall be equal to or greater than the values given in Table 7 or Table 8, as applicable.

For ring seal fittings, a reduction of 5 % in the wall thickness resulting from core shifting is permitted. In such a case, the average of two opposite wall thicknesses shall be equal to or greater than the values given in Table 7 or Table 8, as applicable.

Where a sealing ring is located by means of a retaining cap or ring (see Figure 3), the wall thickness in this area shall be calculated by addition of the wall thickness of the socket and the wall thickness of the retaining cap or ring at the corresponding places in the same cross-sectional plane.

Table 7 — Wall thicknesses of ring seal fittings including expansion couplings
(metric series)

Dimensions in millimetres

Nominal size	Nominal outside diameter	Wall thickness	Wall thicknesses of sockets ($e_2 = 0,9e$)	Wall thickness at groove ($e_3 = 0,75e$)
DN/OD	d_n	e min.	e_2 min.	e_3 min.
32	32	3	2,7	2,3
40	40	3	2,7	2,3
50	50	3	2,7	2,3
63	63	3	2,7	2,3
75	75	3	2,7	2,3
80	80	3	2,7	2,3
82	82	3	2,7	2,3
90	90	3	2,7	2,3
100	100	3	2,7	2,3
110	110	3,2	2,9	2,4
125	125	3,2	2,9	2,4
140	140	3,2	2,9	2,4
160	160	3,2	2,9	2,4
180	180	3,6	3,2	2,7
200	200	3,9	3,5	2,9
250	250	4,9	4,5	3,7
315	315	6,2	5,6	4,7

Table 8 — Wall thicknesses of expansion couplings
(series based on inch dimensions)

Dimensions in millimetres

Nominal size	Nominal outside diameter	Wall thickness	Wall thicknesses of sockets ($e_2 = 0,9e$)	Wall thickness at groove ($e_3 = 0,75e$)
DN/OD	d_n	e min.	e_2 min.	e_3 min.
36	36	3	2,7	2,2
43	43	3	2,7	2,2
56	56	3	2,7	2,2
For existing tools, the following values of the wall thickness are allowed, provided that the deviating value of the wall thickness, e , is marked on the fitting:				
DN/OD	d_n	e min.	e_2 min.	e_3 min.
36	36	2,7	2,4	2
43	43	2,7	2,4	2
56	56	2,7	2,4	2

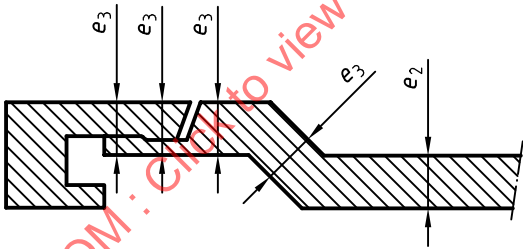


Figure 3 — Example of calculation of wall thickness of socket with retaining cap

6.4 Diameters and lengths of sockets and spigots

6.4.1 Solvent cement sockets and spigots

The diameters and lengths of solvent cement sockets and spigots (see Figure 4) shall conform to Table 9 or Table 10, as applicable.

The manufacturer shall state whether the components are designed with a tapered or a parallel socket. If the socket is tapered, the minimum and maximum values given for d_{sm} shall apply at the mid mean point of the socket with a maximum taper angle of 20' per side. Otherwise, these values of d_{sm} shall apply over the entire length of the socket.

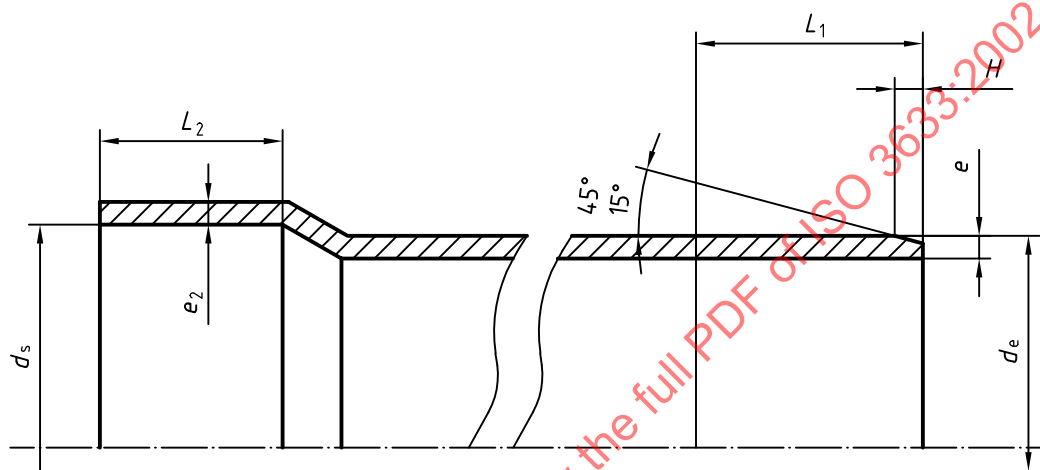


Figure 4 — Basic dimensions of sockets and spigots for solvent cement joints

Table 9 — Diameters and lengths of solvent cement sockets and spigots
(metric series)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Mean outside diameter of spigot		Mean inside diameter of socket		Lengths of sockets and spigots L_1 and L_2 ^a min.
		min.	max.	min.	max.	
32	32	32,0	32,2	32,1	32,4	22
40	40	40,0	40,2	40,1	40,4	26
50	50	50,0	50,2	50,1	50,4	30
63	63	63,0	63,2	63,1	63,4	36
75	75	75,0	75,3	75,2	75,5	40
80	80	80,0	80,3	80,2	80,5	42
82	82	82,0	82,3	82,2	82,5	43
90	90	90,0	90,3	90,2	90,5	46
100	100	100,0	100,3	100,2	100,5	46
110	110	110,0	110,3	110,2	110,6	48
125	125	125,0	125,3	125,2	125,7	51
140	140	140,0	140,4	140,3	140,8	54
160	160	160,0	160,4	160,3	160,8	58
180	180	180,0	180,4	180,3	180,8	60
200	200	200,0	200,5	200,4	200,9	60
250	250	250,0	250,5	250,4	250,9	60
315	315	315,0	315,6	315,5	316,0	60

^a For joints intended for fabrication within a workshop, the values of L_2 may be reduced to C_{max} (see Table 12).

Table 10 — Diameters and lengths of solvent cement sockets and spigots
(series based on inch dimensions)

Dimensions in millimetres

Nominal size DN/OD	Nominal outside diameter d_n	Mean outside diameter of spigot		Mean inside diameter of socket		Lengths of sockets and spigots L_1 and L_2 min.
		min.	max.	min.	max.	
36	36	36,2	36,5	36,3	36,6	18
43	43	42,8	43,1	42,9	43,2	21
56	56	55,8	56,1	55,9	56,2	27

6.4.2 Ring seal sockets and spigots

The diameters and lengths of ring seal sockets and spigots (see Figure 5 and Figure 6) shall conform to one of the following tables, as applicable:

- Table 11 for type S I (short type, system I);
- Table 12 for type S II (short type, system II);
- Table 13 for type M (medium type).

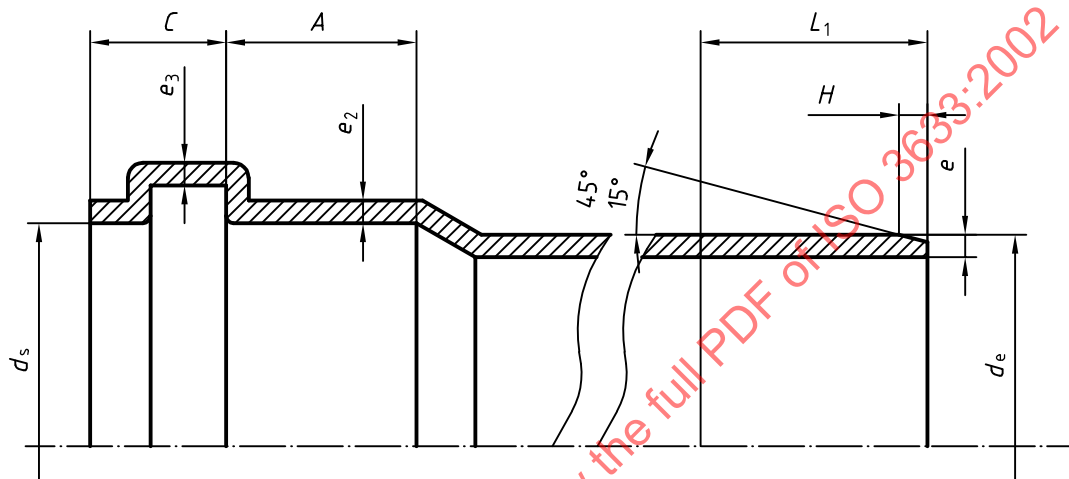


Figure 5 — Basic dimensions of sockets and spigots for elastomeric ring seal joints

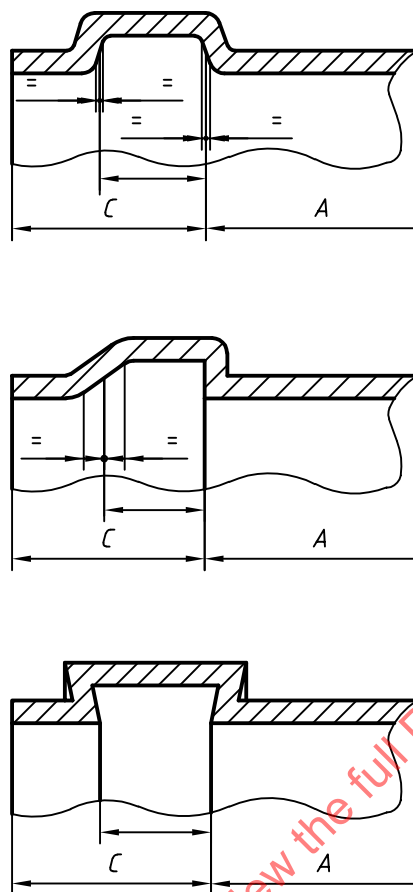


Figure 6 — Typical groove designs for elastomeric ring seal sockets

Where sealing rings are firmly retained, the minimum value for A and the maximum value for C shall be measured to the effective sealing point (see Figure 7) as specified by the manufacturer and, if applicable, in agreement with a certification body.

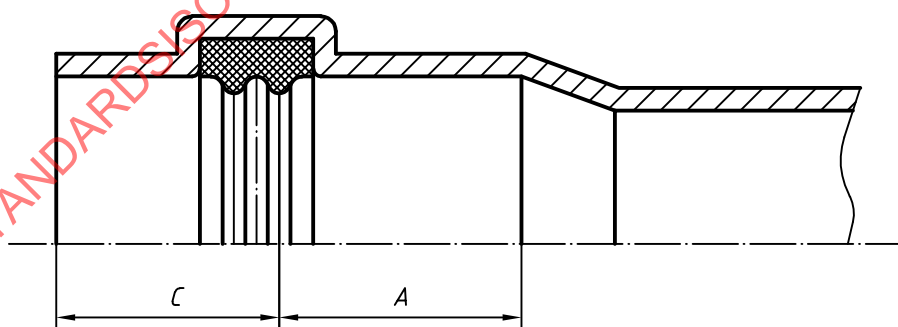


Figure 7 — Example of measurement of effective sealing point

Table 11 — Diameters and lengths of ring seal sockets and spigots, type S I (short type, system I)

Dimensions in millimetres

Nominal size	Mean outside diameter of spigot		Mean inside diameter of socket	Lengths of sockets and spigots		
DN/OD	d_{em}		d_{sm}	A	C	L_1
	min.	max.	min.	min.	max.	min.
32	32,0	32,2	32,3	16	18	34
40	40,0	40,2	40,3	18	18	36
50	50,0	50,2	50,3	20	18	37
63	63,0	63,2	63,3	22	20	37
75	75,0	75,3	75,4	25	20	43
80	80,0	80,3	80,4	26	21	44
82	82,0	82,3	82,4	26	21	44
90	90,0	90,3	90,4	28	22	46
100	100,0	100,3	100,4	30	22	46
110	110,0	110,3	110,4	32	26	54
125	125,0	125,3	125,4	35	26	60
140	140,0	140,4	140,5	38	26	60
160	160,0	160,4	160,5	42	32	60
180	180,0	180,4	180,5	46	36	60
200	200,0	200,5	200,6	50	40	60

Table 12 — Diameters and lengths of ring seal sockets and spigots, type S II (short type, system II)

Dimensions in millimetres

Nominal size	Mean outside diameter of spigot		Mean inside diameter of socket	Lengths of sockets and spigots		
DN/OD	d_{em}		d_{sm}	A	C	L_1
	min.	max.	min.	min.	max.	min.
32	32,0	32,2	32,3	16	18	42
40	40,0	40,2	40,3	18	18	44
50	50,0	50,2	50,3	20	18	46
63	63,0	63,2	63,3	22	20	49
75	75,0	75,3	75,4	25	20	51
80	80,0	80,3	80,4	26	21	52
82	82,0	82,3	82,4	26	21	52
90	90,0	90,3	90,4	28	22	56
100	100,0	100,3	100,4	30	22	56
110	110,0	110,3	110,4	32	26	60
125	125,0	125,3	125,4	35	26	67
140	140,0	140,4	140,5	38	26	70
160	160,0	160,4	160,5	42	32	81
180	180,0	180,4	180,5	46	36	90
200	200,0	200,5	200,6	50	40	99
250	250,0	250,5	250,8	55	70	125
315	315,0	315,6	316,0	62	70	132

Table 13 — Diameters and lengths of ring seal sockets and spigots, type M (medium type)

Dimensions in millimetres

Nominal size	Mean outside diameter of spigot		Mean inside diameter of socket	Lengths of sockets and spigots		
DN/OD	d_{em}		d_{sm}	A	C	L_1
	min.	max.	min.	min.	max.	min.
32	32,0	32,2	32,3	24	18	42
40	40,0	40,2	40,3	26	18	44
50	50,0	50,2	50,3	28	18	46
63	63,0	63,2	63,3	31	20	49
75	75,0	75,3	75,4	33	20	51
80	80,0	80,3	80,4	34	21	52
82	82,0	82,3	82,4	34	21	52
90	90,0	90,3	90,4	36	22	56
100	100,0	100,3	100,4	38	22	56
110	110,0	110,3	110,4	40	26	60
125	125,0	125,3	125,4	43	26	67
140	140,0	140,4	140,5	46	26	70
160	160,0	160,4	160,5	50	32	81
180	180,0	180,4	180,5	54	36	90
200	200,0	200,5	200,6	58	40	99

6.4.3 One-piece expansion couplings for solvent cement sockets and spigots

The diameters and lengths of one-piece expansion couplings shall conform to Table 14 for type M (medium type) or Table 15 for type L (long type), as applicable.

Table 14 — Diameters and lengths of one-piece expansion couplings, type M (medium type),
for solvent cement sockets and spigots
(series based on inch dimensions)

Dimensions in millimetres

Nominal size	Mean outside diameter of spigot		Mean inside diameter of socket	Lengths of sockets and spigots	
DN/OD	d_{em}		d_{sm}	A	L_1
	min.	max.	min.	min.	min.
36	36,2	36,5	36,6	25	37
43	42,8	43,1	43,2	25	40
56	55,8	56,1	56,2	25	43

**Table 15 — Diameters and lengths of one-piece expansion couplings, type L (long type),
for solvent cement sockets and spigots
(metric series)**

Dimensions in millimetres

Nominal size	Mean outside diameter of spigot		Mean inside diameter of socket	Lengths of sockets and spigots	
DN/OD	d_{em}		d_{sm}	A	L_1
	min.	max.	min.	min.	min.
32	32,0	32,2	32,3	65	22
40	40,0	40,2	40,3	65	26
50	50,0	50,2	50,3	65	31
63	63,0	63,2	63,3	65	37
75	75,0	75,3	75,4	65	43
80	80,0	80,3	80,4	65	44
82	82,0	82,3	82,4	65	46
90	90,0	90,3	90,4	65	46
100	100,0	100,3	100,4	65	54
110	110,0	110,3	110,4	65	60
125	125,0	125,3	125,4	65	60
140	140,0	140,4	140,5	65	60
160	160,0	160,4	160,5	65	60
180	180,0	180,4	180,5	65	60
200	200,0	200,5	200,6	65	60

6.5 Types of fitting

This International Standard is applicable to the following generic types of fitting. Other designs of fitting are permitted.

a) Bends (see Figure 8, 9, 10 or 11):

- unswept or swept angle (see ISO 265-1);
- spigot/socket or socket/socket.

The nominal angle, α , may be selected from the following: 15°, 22°30', 30°, 45°, 67°30', 80°, 87°30' to 90°.

b) Couplers (see Figure 12).

c) Reducers (see Figure 13).

d) Branches and reducing branches (branching single or multiple) (see Figure 14, 15, 16 or 17):

- unswept or swept angle (see ISO 265-1);
- spigot/socket or socket/socket.

The nominal angle, α , may be selected from the following: 45° , $67^\circ 30'$, 80° , $87^\circ 30'$ to 90° .

If other angles are required, they shall be agreed between the manufacturer and purchaser and be identified accordingly.

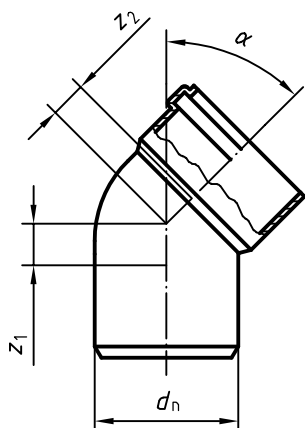


Figure 8 — Bend with single socket (unswept)

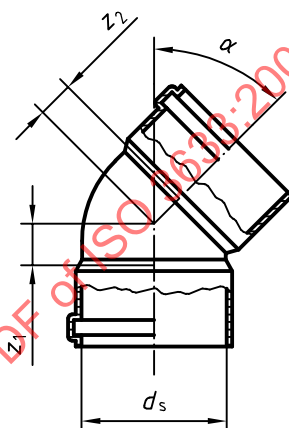


Figure 9 — Bend with only sockets (unswept)

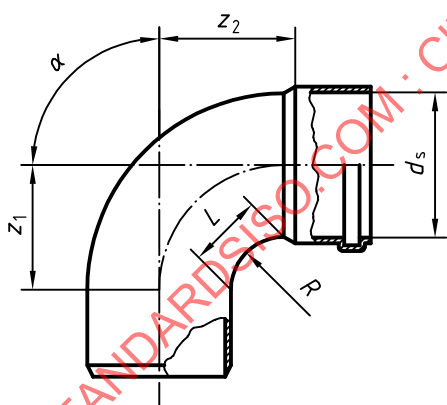


Figure 10 — Bend with single socket (swept)

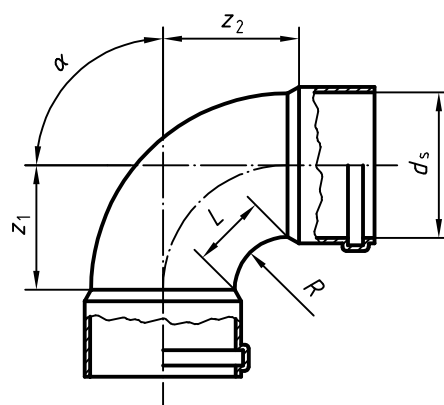


Figure 11 — Bend with only sockets (swept)

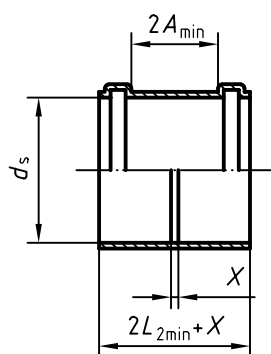


Figure 12 — Coupler

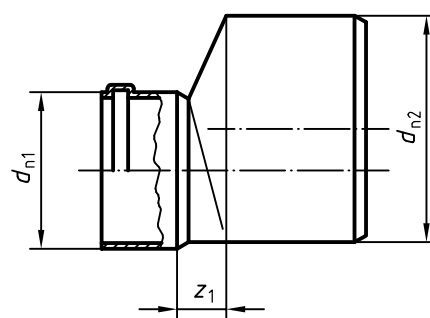


Figure 13 — Reducer

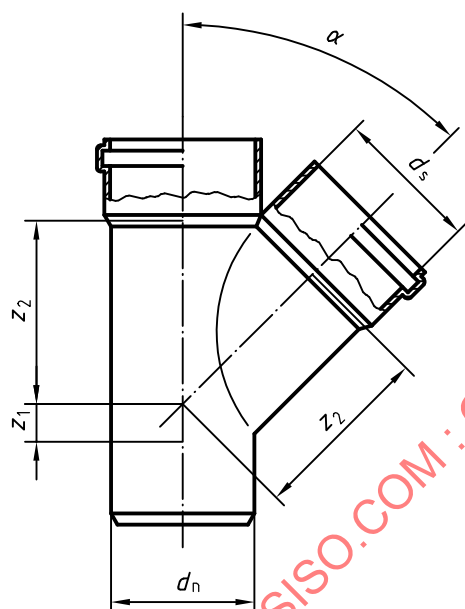


Figure 14 — Branch with single socket (unswept)

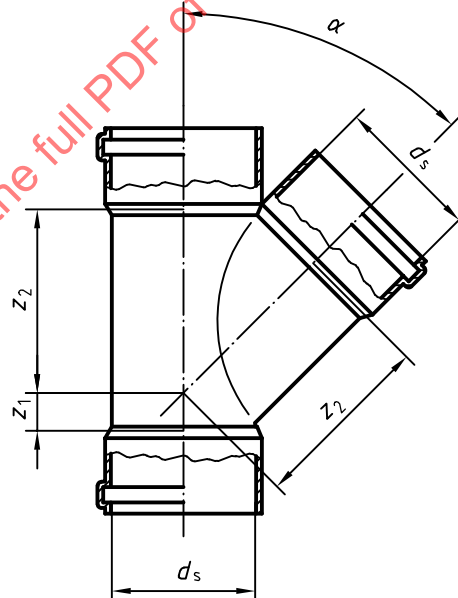


Figure 15 — Branch with only sockets (unswept)

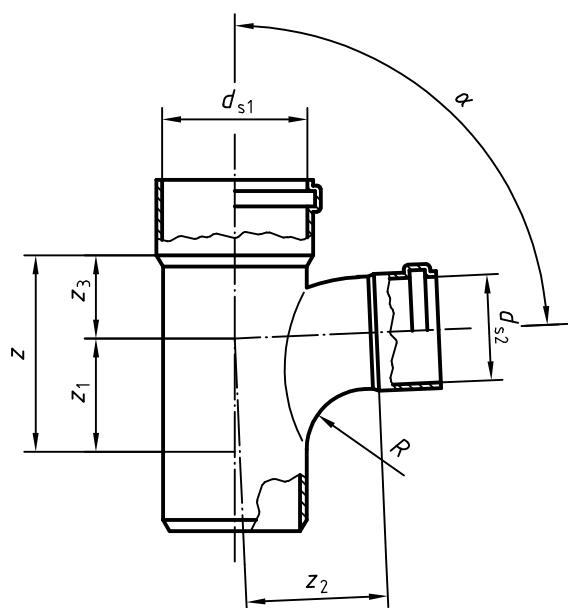


Figure 16 — Reducing branch with single socket (swept)

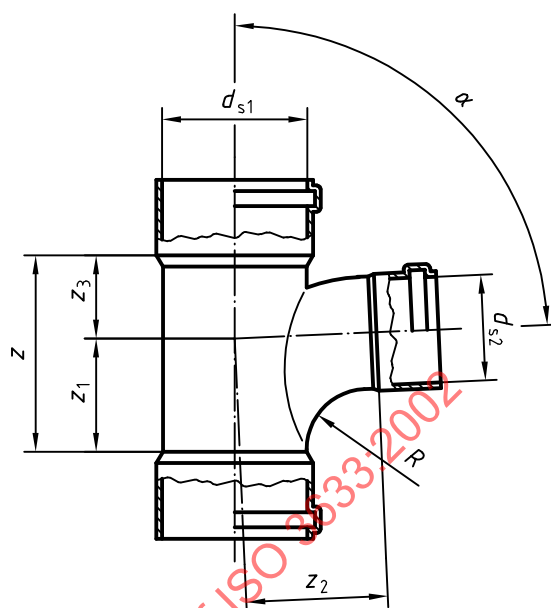


Figure 17 — Reducing branch with only sockets (swept)

7 Mechanical characteristics of pipes

7.1 General characteristics

When determined in accordance with the method specified in Table 16, using the parameters indicated, the general mechanical characteristics of pipes shall conform to the requirements given in Table 16.

The mass and drop height of the striker used in determining the impact resistance (round-the-clock method) as specified in Table 16 are given in Table 17 or Table 18, as applicable.

Table 16 — General mechanical characteristics of pipes

Characteristic	Requirements	Test parameters		Test method
Impact resistance (round-the-clock method)	TIR ≤ 10 %	Type of striker for $d_n < 110\text{ mm}$ $d_n \geq 110\text{ mm}$	Type d25 Type d90	EN 744
		Mass of striker	See Table 17 or Table 18, as applicable	
		Drop height of striker	See Table 17 or Table 18, as applicable	
		Conditioning medium	Water	
		Conditioning and test temperature	(0 ± 1) °C	
		NOTE In the event of indirect testing, the preferred temperature is (23 ± 2) °C.		

Table 17 — Drop height and mass of striker for impact resistance
(metric series)

Dimensions in millimetres

Nominal size	Nominal outside diameter	Mass of striker	Drop height of striker
DN/OD	d_n	kg	
32	32	0,5	600
40	40	0,5	800
50	50	0,5	1 000
63	63	0,8	1 000
75	75	0,8	1 000
80	80	0,8	1 000
82	82	0,8	1 000
90	90	0,8	1 200
100	100	0,8	1 200
110	110	1	1 600
125	125	1,25	2 000
140	140	1,6	1 800
160	160	1,6	2 000
180	180	2	1 800
200	200	2	2 000
250	250	2,5	2 000
315	315	3,2	2 000

Table 18 — Drop height and mass of striker for impact resistance
(series based on inch dimensions)

Dimensions in millimetres

Nominal size	Nominal outside diameter	Mass of striker	Drop height of striker
DN/OD	d_n	kg	
36	36	0,5	600
43	43	0,5	800
56	56	0,5	1 000